505-41-17

Interface Requirements Document between Earth Observing System Data and Information System (EOSDIS) and the NASA Science Internet (NSI)

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CCR 96-1104A

Interface Requirements Document

between the

Earth Observing System Data and Information System (EOSDIS) Core System (ECS)

and the

NASA Science Internet (NSI)

Reviewed by:

_____ _____

Richard desJardins Date
System Engineer
GSFC - Code 505

_____ _____

Candace Carlisle Date
External System Interface Manager
GSFC - Code 505

_____ _____

Melvin Banks Date
~~System Engineer~~ Chief, ESDIS Development
GSFC - Code 505

Approved by:

_____ _____

Christine Falsetti Date
NSI ~~Deputy~~ Project Manager

_____ _____

Dale Harris Date
Associate Director for ESDIS
GSFC - Code 505

GODDARD SPACE FLIGHT CENTER

GREENBELT, MARYLAND

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Preface

This document is a formal contract deliverable with an approval code 1. It was originally submitted in August 1993 as the IRD Between ECS and External Networks. It requires Government review and approval prior to acceptance and use.

This document is under ESDIS Project Configuration Control. Any questions should be addressed to:

Configuration Management Office
The ESDIS Project Office
Goddard Space Flight Center
Greenbelt, Md. 20771
Code 505

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Abstract

The Earth Observing System Data and Information System (EOSDIS) Core System (ECS) involves the collection and distribution of data from space and ground based measurement systems to provide the scientific basis for understanding global change. Using ECS as their window to the EOSDIS, the international science community is able to access data from a distributed archive in the United States and from other international Earth Science support systems. To accomplish this mission, it is necessary for ECS to interface with a wide variety of external systems. This document represents the requirements to provide an interface between ECS and the NASA Science Internet (NSI) project.

The ECS contractor team used the process described in the ECS Methodology for Definition of External Interfaces document to develop these interface requirements. Inter-Project Agreements (IPAs) and Level 2 and Level 3 Requirement Specifications are used in the methodology to evolve the formal Interface Requirements Document (IRD). The ESDIS Project has joint responsibility with the NSI project for development and maintenance of IRD sections that are relevant to the NSI project.

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Abbreviations and Acronyms

1. Introduction

1.1 Identification

This Interface Requirements Document (IRD), Contract Data Requirements List (CDRL) Item 039, whose requirements are specified in Data Item Description (DID) 219/SE1, is a required deliverable under the Earth Observing System (EOS) Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000). It defines the interface requirements between ECS and the NASA Science Internet (NSI).

1.2 Scope

This IRD defines all of the system interfaces that exist between ECS and the NSI networks. The Earth Science Data and Information System (ESDIS) Project has joint responsibility with the NSI project for the development and maintenance of IRD sections that are relevant to the NSI interface**.** Any changes in the interface requirements must be agreed to by the relevant participating parties, and then assessed at the ESDIS Project Level. This IRD will be approved under the signature of the ESDIS Project Manager and NSI.

1.3 Purpose and Objectives

This document is written to formalize the interpretation and general understanding of the interface between ECS and the NSI. This document provides clarification and elaboration of the ECS–NSI interface requirements from the EOSDIS Core System (ECS) Requirements Specification. It is meant to stand alone as a total document and contains more detail than a Level 3 requirements specification.

The objective of this document is to provide a focus for defining the ECS-NSI Interface Control Document (ICD) ~~which will be jointly developed by ESDIS and NSI~~ to the interfaces identified in this IRD.

This document provides a point of mutual control of external interface definitions for the ESDIS CCB and the CCB(s) serving the NSI**.**

1.4 Status and Schedule

This document has been approved by the ECS Contractor CCB as a final IRD. As a formal contract deliverable with approval code 1, this document requires Government review and approval prior to acceptance and use. At the Government's option, this document may be designated to be under full Government CCB control.

Changes may be submitted for consideration by Contractor and Government CCBs under the normal change process at any time.

1.5 Document Organization

This Interface Requirements Document is organized as described below

Section 1 — Introduction - Introduces the IRD's scope, purpose, objectives, status, schedule, and document organization.

Section 2 — Related Documentation - Provides a bibliography of reference documents for the IRD organized by parent, applicable, and information subsections.

Section 3 — Systems Description - Provides an overview of both systems and a discussion of the system components involved in the interface. Context diagrams depicting the functional interfaces are also included.

Section 4 — Data Flow Descriptions - Provides a discussion of how the interface is used from an operational point of view. A table is also provided to summarize the data flow interfaces.

Section 5 — Functional and Performance Interface Requirements - Requirements are sorted for presentation by denoting functional or performance type. Traceability to parent documents is also noted in this section.

Section 6 — Interface Control Documentation Plan - Identifies and summarizes the ICD(s) that will spawn from this IRD.

Section 7 — Issues - Describes outstanding issues that remain to be resolved, together with the plan for their resolution.

2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content derive:

193-208-SE1-001	Methodology for Definition of External Interfaces for the ECS Project
301-CD-002-003	EOSDIS Core System Project, System Implementation Plan for the ECS Project
423-10-01-00	Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements, Volume 0, 2/18/93
423-10-01-01	Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements, Volume 1
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System

2.2 Applicable Documents

The following documents are referenced herein and are directly applicable to this document. In the event of conflict between any of these documents and this document, this document shall take precedence.

~~220-CD-001-003~~	~~Communications Requirements for the ECS Project, Final~~
223-CD-001-002	ECS External Data Traffic Requirements
none	Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) - NASA Science Internet (NSI) Inter-Project Agreement, 2/10/94

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

NMI 2410.7A	NASA Management Instruciton: Assuring the Security and Integrity of NASA Automated Information Resources, 7/8/88

none	National Computer Systems Laboratory (NCSL) Bulletin, Guidance to Federal Agencies on the Use of Trusted Systems Technology, 7/90
DO-SEC1037.0	Network Science Internet, Network Security Archive, Handbook, 8/93
DO-SEC1042.0	Network Science Internet, Introduction to Network Security, 9/93
DO-SEC1043.0	NASA Science Internet, Network Security Basics, A Primer for System Administrators, 8/93
NAS2-3210-648	Network Science Internet, Network Security Information, 9/93
RFC 1600	Internet Official Protocol Standards, 3/94

3. Systems Descriptions

3.1 Systems Relationship Overview

The ECS and the NSI will work in coordination to perform interchange between external Wide Area Networks. NSI is used to make data available from ECS facilities to EOSDIS users, including EOS project funded investigators, non-EOS affiliated scientists and researchers, and the research community at large (including academia and industry). Figure 3.1-1 depicts the interface between ECS, NSI and users, and Figure 3.1-2 depicts the management interface between ECS and NSI. These figures are provided for information purposes only.

The NSI Project Office is responsible for managing the NASA Science Internet, which includes the following activities:

a. Engineering the network (e.g., backbone, tail circuits, internal routers, etc.)

b. Scheduling installation of new network services and backbone upgrades based on customer (ESDIS and others) requirements

c. Network performance monitoring

d. Network capacity planning

e. Fault and error detection, isolation and fault resolution

Hughes ~~(HITC)~~ Information Technology Systems (HITS) is responsible for system management of the ECS, (e.g., System Monitoring and Coordination (SMC), ECS Development Facility (EDF), etc.), while ESDIS is responsible for providing prioritized external network requirements for ECS to NSI.

Sections 3.2 and 3.3 provide overall views of the ECS and the NSI to form a basis for understanding the interface requirements between them.

3.2 EOSDIS Core System (ECS)

3.2.1 ECS Overview

The ECS is one component of the EOSDIS. ECS supports the planning, scheduling, and control of U.S. EOS spacecraft and instruments. In addition to fully supporting the EOS series, the ECS provides information management and data archive and distribution functions for all other NASA Earth science flight missions, NASA instruments flown on non-NASA flight missions, and for other NASA held Earth science data.

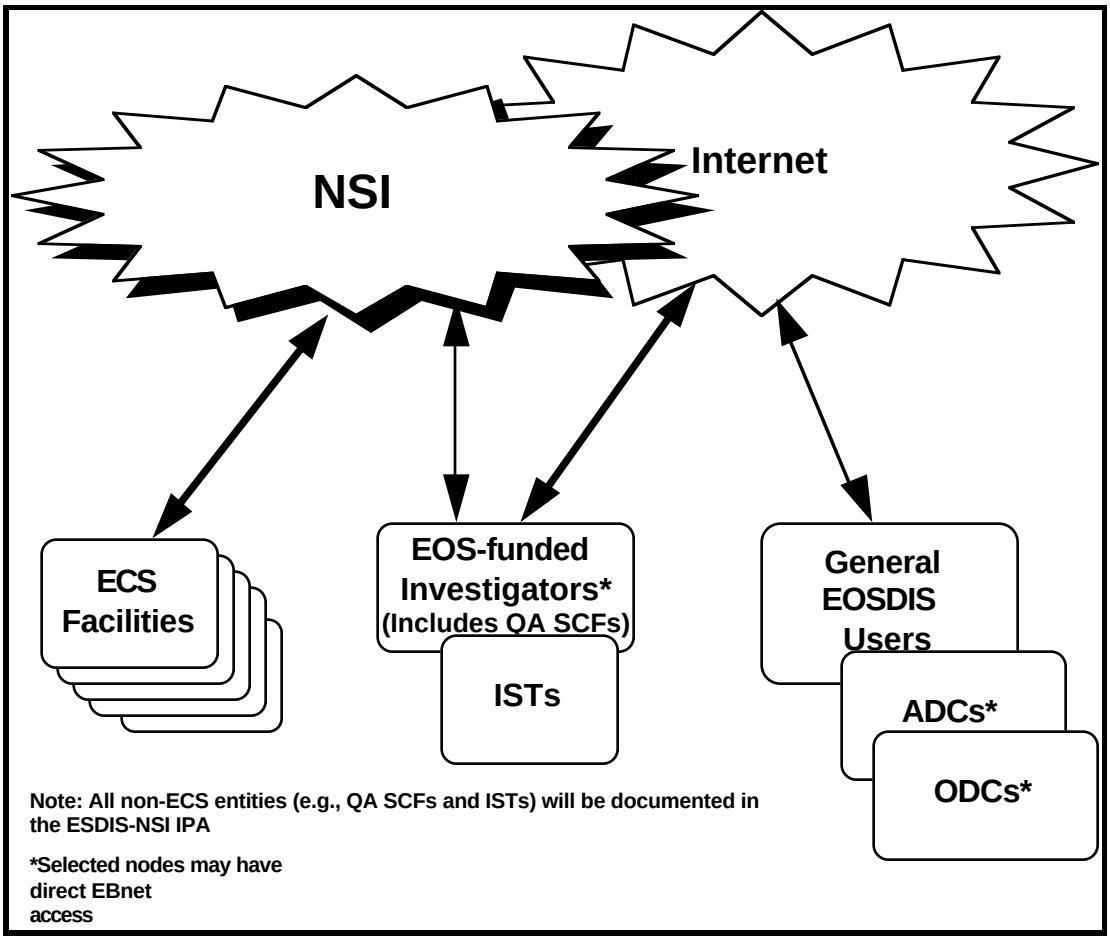

Figure 3.1-1. Interface Between Users, ECS and NSI

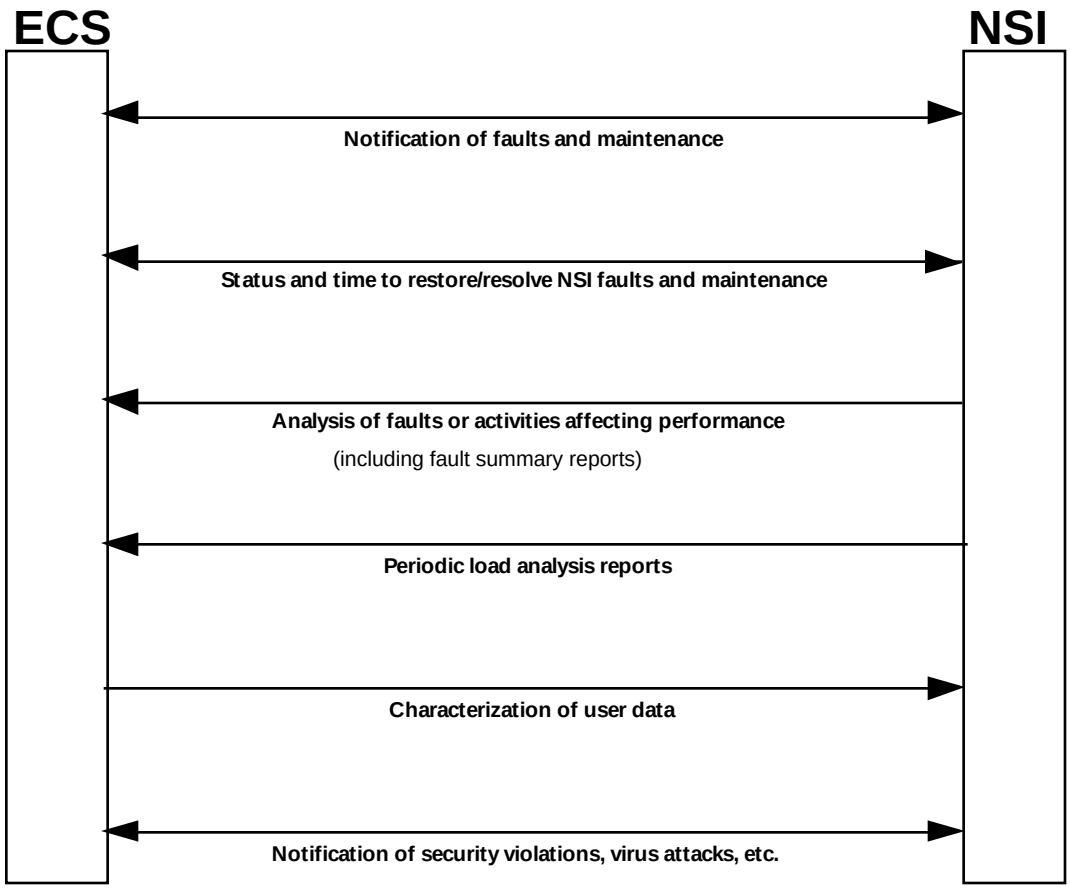

Figure 3.1-2. ECS-NSI Management Interface

3.2.2 ECS Segments

ECS is composed of three segments defined to support three major operational areas: flight operations, science data processing, and communications/system management. The ECS segments are described below:

a. The Flight Operations Segment (FOS) manages and controls the EOS spacecraft and instruments. The FOS includes the EOS Operations Center (EOC)/Instrument Control Center (ICC), which is responsible for mission planning, scheduling, control, monitoring, and data analysis in support of mission operations for U.S. EOS spacecraft and instruments. The ECS EOC/ICC is located at the Goddard Space Flight Center (GSFC). The FOS also provides investigator-site ECS software (the Instrument Support Terminal [IST] toolkit) to connect a Principal Investigator (PI) or Team Leader (TL) to the FOS in remote support of instrument control and monitoring. (Investigator facilities are outside the FOS, but connected to it by way of NSI.)

b. The Science Data Processing Segment (SDPS) provides a set of ingest, processing, and distribution services for science data and a data information system for the entire EOSDIS. The SDPS processes data from the EOS instruments to Level 1-4 data products. The SDPS also provides short- and long-term storage for EOS, other Earth observing missions, and other related data, software, and results, and distributes the data to EOSDIS users. The SDPS contains a distributed data and information management function and user services suite for the ECS, including a catalog system in support of user data selection and ordering. The ECS DAACs are composed of both the SDPS and CSMS segments.

c. The Communications and System Management Segment (CSMS) provides overall ECS management of ECS ground system resources, provides communications/networking services for an extensive science data communications network, and manages the interfaces to the DAAC-to-DAAC processing network, the Level 0 data providers, and NSI. The CSMS also includes the LANs at each of the DAACs and ECS Operation Center (EOC) to support ECS operations; connection to International Partners (IPs); and interfaces at DAACs with Nascom, and NSI. The CSMS System Monitoring and Coordination center (SMC), along with local system management capabilities at DAAC sites and the EOC, provides system management services for ECS ground system resources. Most of the operations staff is considered part of SDPS or FOS, including Local System Management (LSM) operators. The ECS DAACs are composed of both the SDPS and CSMS segments.

3.3 NSI Description

The NASA Science Internet (NSI) is an open computer communications network that serves the needs of NASA's diverse science and research community worldwide. NSI's mission is to support NASA's scientific goals and objectives by providing reliable, global network communications for scientific research. It accomplishes its mission by identifying and managing all existing and future NASA science network requirements, engineering high quality solutions in a rapid and cost-effective manner, providing and maintaining a trouble-free network in a

dynamically evolving environment, developing tools to enhance the usefulness of the network, and providing information on how to find and use networking resources.

NSI was established in 1988, and is headquartered at Ames Research Center within the Wide–Area Networks and Services Branch of the Information and Communications Division. In 1989, both the DECnet-based Space Physics Analysis Network (SPAN) and the TCP/IP-based NASA Science Network (NSN) were brought together as a single project called NSI. Today NSI is a high-speed, multi-protocol, international network that supports both DECnet and TCP/IP protocols. NSI currently serves nearly 10,000 NASA researchers and collaborators worldwide, with high-performance links and gateways connecting to several thousand research, educational and public commercial networks via the Internet and national research networks in Europe, Asia, and other continents. In the future, NSI will continue to focus its technical expertise and leadership to benefit NASA.

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4. Data Flow Descriptions

4.1 Overview

Table 4.1-1 provides an overview of the data flows between the ECS and the NSI. This table shows the network source and destination of the flow, the data flow name, and a short description of the data flow. The context of each of these data flows is presented in the following paragraphs.

There are two major types of services between ECS and NSI: network communications and network management as offered in the context of an enterprise network. As depicted in the Interface Flow diagram (Figure 3.1-1), the primary function of this network is to transmit information between ECS and external users using the NSI Wide Area Network (WAN) (See data flows 15 and 16, Table 4.1-1). Additionally, other data flows relating to network management are shown in Figure 3.1-2.

Other data flows are associated with the management of the network in terms of services offered. These services include: network fault management, network security management and network performance management. While system and network services in these areas are related, network services deal with the issues affecting layers one through four of the International Standards Organization (ISO) Open Systems Interconnect (OSI) Reference Model (RM) communication stack: the physical layer, the data link layer, the network layer, and transport layer. ECS will implement its own system and network management, which will influence the interfaces between networks. The following subsections provide more information on the network and identifies the network interface components.

4.2 NSI - ECS Network Services

4.2.1 Organization and Physical Locations

NSI will assure ~~adaquate~~ adequate Internet connectivity to the following ECS facilities:

1. ECS at the GSFC DAAC, Goddard Space Flight Center (GSFC), Greenbelt, Maryland
2. ~~ECS~~ EOS Operations Center (EOC), Goddard Space Flight Center (GSFC), Greenbelt, Maryland
3. System Monitoring and Coordination facility (SMC), Goddard Space Flight Center (GSFC), Greenbelt, Maryland
4. ECS at the EDC DAAC, Earth Resources Observation System (EROS) Data Center (EDC), Sioux Falls, South Dakota
5. ECS at the JPL DAAC, Jet Propulsion Laboratory (JPL), Pasadena, California
6. ECS at the LaRC DAAC, Langley Research Center (LaRC), Hampton, Virginia
7. ECS at the NSIDC DAAC, University of Colorado, National Snow and Ice Data Center (NSIDC), Boulder, Colorado

8. ECS at the ASF DAAC, University of Alaska, Alaska Synthetic Aperture Radar (SAR) Facility (ASF), Fairbanks, Alaska

~~9. ECS at the MSFC DAAC, Marshall Space Flight Center (MSFC), Huntsville, Alabama~~

Note: Although NSI has no requirement to provide connectivity to Oak Ridge National Laboratory (ORNL), ORNL is currently connected to the Internet via a 45 Mbps communications circuit.

The document ~~"Communications Requirements for the ECS Project," 220-CD-001-003~~, "ECS External Data Traffic Requirements," (223-CD-001-003) documents the data flow volumes to/from each of the DAACs.

4.2.2 Network Protocols

The agreement between NSI and ESDIS, as outlined in their IPA, identifies the Internet as the mechanism to provide science users access to EOSDIS facilities, including the DAACs. The Internet Protocol (IP) and the upper layer protocols that rely on it, are the agreed upon protocols used by NSI as the primary Internet provider; these protocols will provide interoperability between NSI and ECS. Interconnected routers must support network protocols which are robust and consistent with existent Internet protocols and standards (see RFC 1600 for applicable standards). All interconnecting networks attaching to NSI are at least IP-based relays to other networks or user sites. Additional network protocols or enhancement features are allowed but should not affect the network availability, performance, or interconnectivity. Each DAAC facility's router should be flexible enough to allow evolving routing protocols to emerge (e.g., OSPF, EGP, BGP, etc.).

4.2.3 Demarcation Points

The NSI's DAAC facility router, where provided, is the demarcation point between NSI and ECS for shared information (such as reports and data), network services (such as network reports), and network management services (e.g., fault, performance, and security management).

4.3 NSI - ECS Network Management Service Description

There are two types of facilities that describe the distribution of network management activities. The first facility, the System Monitoring and Coordination center (SMC), refers to a centralized service provider. In general, the SMC provides network services that require coordination among DAACs, or result in benefits to multiple DAACs, as well as some services in support of NSI. Secondly, the Local System Manager (LSM) refers to DAAC-resident services in support of the ECS DAAC LANs and systems.

Services of primary interest with regard to NSI are fault, performance, and security management. Generally, the following subsections will address:

a. interaction and the interfaces between ~~the LSM~~ ECS DAACs, SMC and NSI Network Operations Center (NOC),

b. approach to working with NSI, including management information exchange needed between networks.

4.3.1 Fault Management

The responsibility for network fault management for NSI to ECS services will be shared between the organizations.

ECS will rely on its own services, to the extent practical, to detect faults and interruptions in services, and then will work with NSI to isolate and diagnose them. Network faults and interruptions refer to severe loss of network functionality which may have an impact on the network performance. This should include faults internal to NSI's network, or faults at NSI connections to other EOSDIS sites (i.e., DAACs and SCFs for which NSI is the primary on-site Internet provider for data exchange with ECS facilities) if the faults could result in reduced level of service to ECS facilities or to EOSDIS locations. In the absence of criteria agreed upon by both NSI and ECS, the determination of whether a fault could result in reduced level of service to ECS or its users will be based on NSI's judgment, taking into consideration its knowledge of the use of the network, and the history of previous faults and their effects on NSI users.

Each ~~LSM~~ ECS DAAC will have read access to its NSI interface router(s) MIB(s), in order to obtain status and performance-related information. If faults are detected by the DAACs ~~LSMs~~, and they seem to be associated with NSI services, the ~~LSM~~ DAAC operations staff will contact NSI directly. However, since NSI may sometimes be able to detect and isolate faults more quickly than ECS, it is the responsibility of NSI to always immediately notify the affected ~~LSM(s)~~ and SMC of outages, as soon as the faults are isolated (localized to specific network components) (See data flows 5 and 6, Table 4-1). This ensures redundancy in case either the LSM or SMC is unreachable. ~~In case of network faults at (or on the access paths to) the SMC, one of the LSMs, designated by the SMC, will function as a backup to receive management information from NSI and other network providers.~~ NSI will be provided with contact information at alternate ECS sites in case the SMC is unreachable.

Fault notification should be in the form of a consistently formatted electronic message that can be automatically parsed by a receiving program from ECS (i.e., whether by email or by an alert notification message generated by a network management product). It should contain enough information to determine the nature of the fault and which sites are affected. These notifications contribute to an audit trail that assist with performing network analysis. (The value of an electronic notice is that it can be easily logged and tracked.) NSI will make its best effort to make additional information pertaining to faults (e.g., those that, after the fact, may be judged to have affected ECS to user performance) available to the ~~LSM~~ DAAC or SMC staff upon request. Additionally, whenever NSI performs any preventive maintenance on its network that may result in reduced network performance, NSI shall notify the affected ~~LSM(s)~~ ECS DAAC sites and the SMC in advance. ~~the same way as it would for network faults (see data flows 5 and 6, Table 4-1).~~ In the absence of criteria agreed upon by both NSI and ECS, the determination of whether preventive maintenance could result in reduced level of service to ECS or its users will be based on NSI's judgment, taking into consideration its knowledge of the use of the network, and the history of previous faults and their effects on NSI users. Outages of interest are not limited to outages at site demarcation points, but include devices "on the inside" of the networks (e.g., routers or network switches), since the cutover to alternate devices or rerouting within a network may have a detectable impact on network performance.

Network fault recovery (the action taken to restore service to the network) requires coordination between network providers, NSI and ECS. If recovery of the fault significantly affects the quality of service provided to ECS, NSI should notify ECS, both at the local site level and the SMC, of expected duration of the effect.

Upon resolution of each fault (restoral to service of the network at the required performance level), follow-up messages to the ~~LSM~~ ECS DAAC and SMC of an agreed upon format will contain additional information about each fault: the date and time each fault was repaired, and the nature of the repair (See data flows ~~8 and 9~~ 7 and 8, Table 4-1). This will enable ECS to develop fault histories, summary reports, and trend analyses.

4.3.2 Performance Management

Performance management is comprised of several specific services: performance policy management, data collection, performance analysis, performance optimization, and trend analysis. The distribution of these services vary according to where they apply in the network. Although ECS will have primary responsibility for measuring network response between its sites, ECS does not have the visibility inside the NSI network and so will not be able to measure utilization of its backbones. However, since ECS is responsible for maintaining end-to-end quality assurance and performance of network services, it needs to be cognizant of data and analyses that provide insight into the network utilization and resource allocation (e.g., network congestion that would affect response time to users). NSI shall provide ECS SMC with periodic, nominally monthly, load analysis reports. These reports would reflect or summarize measurements of performance over various time intervals in order to enable ECS to understand variations in utilization over time (See data flow 13, Table 4-1). In return, ECS will provide NSI with periodic reports that characterize user requests and resulting traffic over NSI (See data flow 14, Table 4-1).

4.3.3 Security Management

NSI's network security mechanisms, techniques and procedures, as they comply with federal and NASA mandates, are explained in detail in:

a. DO-SEC1037.0; NASA Science Internet, Network Security Archive, Handbook, August 1993.

b. DO-SEC1042.0; NASA Science Internet, Introduction to Network Security, September 1993.

c. D0-SEC1043.0; NASA Science Internet, Network Security Basics, A Primer for System Administrators, August 1993.

d. NAS2-3210-648; NASA Science Internet, Network Security Information, September 1993.

If a security breach of the NSI network is detected, it should be reported immediately to the Computer Emergency Response Team (CERT) (See data flows 10 and 12, Table 4-1). The NASA CERT is NSI's designated primary point of contact and will contact other agencies (i.e., SMC and ~~LSM~~ ECS DAACs) that need information regarding an incident (See data flow 9 and

11, Table 4.1-1). The CERT can be contacted through the NOC 24-hour hotline. When an intrusion (or other security problem) is detected, CERT will notify the local administrators of potentially affected site(s).

4.4 Access to Relevant Research and Reports

In addition to needed network reports as explained above, NSI will provide ECS with relevant research or investigations that are performed by NSI which will augment the network evolution process or growth, or aid in network planning and scheduling.

In order to assist NSI in doing a better job of capacity and network resource planning, ECS will provide to NSI a characterization of user data (e.g., type, size, etc.) sent from DAACs to users. The document ~~"Communications Requirements for the ECS Project" (220-CD-001-003),~~ "ECS External Data Traffic Requirements" (223-CD-001-002) provides estimates of the volume of data flows between ECS and NSI.

Table 4.1-1. ECS/NSI Data Flows

Flow Number	From	To	Data Flow	Description
1.	~~LSM~~ ECS DAAC	NSI-NOC	Fault Notification	Notification of faults or maintenance activities affecting NSI network performance.
2.	SMC	NSI-NOC	Fault Notification	Notification of faults or maintenance activities affecting NSI network performance.
3.	~~LSM~~ ECS DAAC	NSI-NOC	Fault Resolution	Information regarding status and time to repair /resolve NSI related faults, and nature of repair.
4.	SMC	NSI-NOC	Fault Resolution	Information regarding status and time to repair /resolve NSI related faults, and nature of repair.
5.	NSI - NOC	~~LSM~~ ECS DAAC	Fault Notification	Notification of faults or maintenance activities affecting NSI network performance.
6.	NSI - NOC	SMC	Fault Notification	Notification of faults or maintenance activities affecting NSI network performance.
7.	NSI-NOC	~~LSM~~ ECS DAAC	Fault Resolution	Information regarding status and time to repair /resolve NSI related faults, and nature of repair.
8.	NSI-NOC	SMC	Fault Resolution	Information regarding status and time to repair /resolve NSI related faults, and nature of repair.
9.	NSI-NOC	SMC	Network Security - Intrusion detection	Notification of security breach
10	SMC	NSI - NOC	Network Security - Intrusion detection	Notification of security breach
11.	NSI-NOC	~~LSM~~ ECS DAAC	Network Security - Intrusion detection	Notification of security breach
12.	~~LSM~~ ECS DAAC	NSI - NOC	Network Security - Intrusion detection	Notification of security breach
13.	NSI-NOC	SMC	Performance Management	Periodic load analysis reports
14.	SMC	NSI - NOC	Performance Management	Characterization of user data
~~15.~~	~~User~~	~~DAAC/ EOC/ SMC[1]~~	~~Searches and Request(s)~~	~~Request(s) for products, data packages, reports, etc by SCFs, ISTs, non-EOSDIS users, etc.~~

~~[1] User requests are submitted to the DAAC for product order processing and other administrative functions. NSI is the mechanism (network) for relaying the science data packages back to the user.~~

~~16.~~	~~DAAC/ EOC/ SMC~~[1]	~~User~~	~~Data~~	~~Products, data packages, etc. for SCFs, ISTs, non-EOSDIS users, etc.~~

5. Functional and Performance Interface Requirements

5.1 Requirements Traceability

The functional and performance interface requirements identified in this document will be traced to the following parent documents:

a. EOSDIS Core System (ECS) Requirements Specification

b. Earth Science Data and Information System (ESDIS) Project—Level 2 Requirements

c. ESDIS-NSI Inter-Project Agreement

Appendix A, Table A-1 of this document provides a listing of each IRD requirement by requirement number and an identification of its parent requirements as found in these documents. Parent requirements will be identified by requirement number or, in the case where a parent requirement comes from a document that does not have numbered requirements (e.g., IPA), the parent will be identified by the lowest level section number in the parent document.

5.2 Functional and Performance Interface Requirements

NSI-0010 NSI, responsible for EOSDIS "Mission Success" network services, shall provide network connectivity to the following ECS facilities:

a. ECS at the GSFC DAAC, Goddard Space Flight Center (GSFC), Greenbelt, Maryland

b. ~~ECS~~ EOS Operations Center (EOC), Goddard Space Flight Center (GSFC), Greenbelt, Maryland

c. System Monitoring and Coordination facility (SMC), Goddard Space Flight Center (GSFC), Greenbelt, Maryland

d. ECS at the EDC DAAC, Earth Resources Observation System (EROS) Data Center (EDC), Sioux Falls, South Dakota

e. ECS at the JPL DAAC, Jet Propulsion Laboratory (JPL), Pasadena, California

f. ECS at the LaRC DAAC, Langley Research Center (LaRC), Hampton, Virginia

g. ECS at the NSIDC DAAC, University of Colorado, National Snow and Ice Data Center (NSIDC), Boulder, Colorado

h. ECS at the ASF DAAC, University of Alaska, Alaska Synthetic Aperture Radar (SAR) Facility (ASF), Fairbanks, Alaska

~~i. ECS at the MSFC DAAC, Marshall Space Flight Center (MSFC), Huntsville, Alabama~~

NSI-0020 NSI shall provide support for TCP/IP communication protocols and services to ~~ESN~~ ECS.

NSI-0030 NSI shall have the capability of sending and ECS shall have the capability of receiving notification of faults in NSI's network that may affect the quality of NSI services between ECS and its users.

NSI-0032 ECS shall have the capability of sending and NSI shall have the capability of receiving notification of faults in ECS networks that may affect the quality of NSI services between ECS and its users.

NSI-0040 NSI shall make available to ECS information regarding fault status and estimated time to repair or resolve NSI faults that may affect the quality of NSI services between ECS and its users.

NSI-0050 NSI shall provide ECS with periodic summary information about faults that may have affected the quality of NSI services between ECS and its users.

NSI-0060 NSI shall provide ECS SMC with load analysis reports, reflecting or summarizing NSI performance measurements over various time intervals.

NSI-0070 NSI shall have the capability of sending and ECS shall have the capability of receiving notification of security breaches at NSI sites or within the NSI network that could potentially affect ECS sites.

NSI-0080 ECS shall have the capability of sending and NSI shall have the capability of receiving notification of security breaches at ECS facilities that could affect NSI and other EOSDIS sites.

6. Interface Control Documentation Plan

The ICD which corresponds to this IRD ~~will be~~ is entitled ECS-NSI ICD. The ICD ~~will define~~ defines the functional and physical design of the interface between ECS and the NSI, and ~~will include~~ includes the precise configuration of each interface. ~~All modes (options) of data exchange for each interface will be described as well as the conditions required for each mode or option. Additionally, data rates, error conditions, and error handling procedures will be included. The sequence of exchanges will be completely described (e.g., required handshaking.)~~ Communications protocols or physical media will be detailed for each interface, with appropriate references to standards documentation. The ECS-NSI ICD ~~will be~~ is controlled by ESDIS Configuration Control. ~~Development of this~~ The ICD ~~is the responsibility of the~~ was developed by the ECS contractor. ~~The draft version of this ICD is scheduled for completion by PDR. The final version of this ICD is scheduled for completion by CDR.~~

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7. ISTs and QA SCFs Network Support Requirements

~~The allocation to NSI of the network support requirements for ISTs and QA SCFs is currently under review within ESDIS, in cooperation with all affected organizations (i.e., ECS, FOS, NSI, AM-1). The requirements are being scrubbed with the instrument teams, and the ability of NSI/Internet to support the requirements is being analyzed. A decision as to whether to move some or all of these support requirements to EBnet instead of NSI will be made by October 1995. If this document needs to be updated to reflect that decision, the necessary updates will be processed as a separate CCR.~~

Network support requirements of ISTs and QA SCFs have been allocated to NSI. These requirements are provided in the document "ESDIS-NSI IRD for Non-ECS EOSDIS Elements" (ESDIS Document Number TBD).

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Appendix A. Requirements Traceability

Table A-1. Requirements Traceability

ECS/NSI IRD Requirement	EOSDIS Core System (ECS) Requirements Specification	Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements	ESDIS-NSI IPA *
NSI-0010	ESN-0006	EOSDIS-3306, EOSDIS-3308	~~1.3.ab,d,e,f,g,h,i;~~ ~~2.2.1.a,d,e,f,g,h,i~~ TBD
NSI-0020	ESN-0003, ESN-1180, ESN-1340 (derived)	EOSDIS-3306, EOSDIS-3308	TBD
NSI-0030	EOSD0500, ESN-0780 (derived)	EOSDIS-3297	~~5.3~~ TBD
NSI-0032	EOSD0500, ESN-0780 (derived)	EOSDIS-3297	~~5.3~~ TBD
NSI-0040	EOSD0500, ESN-0780 (derived)	EOSDIS-3297	~~5.3~~ TBD
NSI-0050	ESN-0780, ESN-1000, SMC-4310 (derived)	EOSDIS-3297	~~5.3~~ TBD
NSI-0060	SMC-3380, ESN-1070 (derived)	EOSDIS-3297	TBD
NSI-0070	EOSD2100, EOSD2510, EOSD2710, ESN-1380, ESN-1430, SMC-5340 (derived)	EOSDIS-1588	~~5.4~~ TBD
NSI-0080	EOSD2100, EOSD2510, EOSD2710, ESN-1380, ESN-1430, SMC-5340 (derived)	EOSDIS-1588	~~5.4~~ TBD

* The ESDIS-NSI IPA (Inter Project Agreement) is in the process of being changed. The IPA traceability information will be included upon the completion of the IPA.

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Abbreviations and Acronyms

ASF	Alaska SAR Facility
BGP	Boundary Gateway Protocol
CCB	Configuration Control Board
CDRL	Contract Data Requirements List
CSMS	Communications and System Management Segment
DAAC	Distributed Active Archive Center
DCN	Document Change Notice
DID	Data Item Description
~~Ecom~~	~~EOS Communications~~
EBnet	EOSDIS Backbone Network
ECS	EOSDIS Core System
EDC	EROS Data Center
EDOS	EOS Data Operations System
EGP	Exterior Gateway Protocol
EOC	Earth Operations Center
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
EROS	Earth Resources Observation System
ESDIS	Earth Science Data and Information System
~~ESN~~	~~EOSDIS Science Network~~
FOS	Flight Operations Segment
GSFC	Goddard Space Flight Center
ICC	Instrument Control Center
ICD	Interface Control Document
IP	International Partner, Internet Protocol
IRD	Interface Requirement Document

IST	Instrument Support Terminal
JPL	Jet Propulsion Laboratory
LaRC	Langley Research Center
LSM	Local System Manager
MOU	Memorandum of Understanding
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
SMC	System Monitoring and Coordination
NOC	Network Operations Center
NSI	NASA Science Internet
NSIDC	National Snow and Ice Data Center
ORNL	Oak Ridge National Laboratory
OSPF	Open Shortest Path First
PI	Principal Investigator
PIP	Project Implementation Plan
PSCN	Program Support Communications Network
SAR	Synthetic Aperture Radar
SDPS	Science Data Processing Segment
SMC	System Management ~~Center~~ and Coordination
TL	Team Leader